Vidyavardhini's College of Engineering and Technology

Department of Artificial Intelligence & Data Science

Experiment No.2
Aim: To realize the gate using universal gates
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Roll no: 61
Date of Performance:
Date of Submission:

Aim - To realize the gates using universal gates.

Objective -
1) To study the realization of basic gates using universal gates.
2) Understanding how to construct any combinational logic function using NAND or NOR gates only.

Theory -
AND, OR, NOT are called basic gates as their logical operation cannot be simplified further. NAND and NOR are called universal gates as using only NAND or only NOR, any logic function can be implemented.
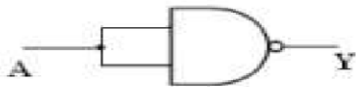
Components required -
1. IC's 7400(NAND) 7402(NOR)
2. Bread Board.
3. Connecting wires.
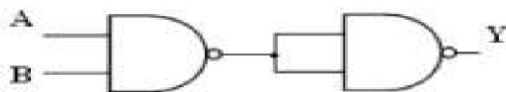
Circuit Diagram -

Implementation using NAND gate:
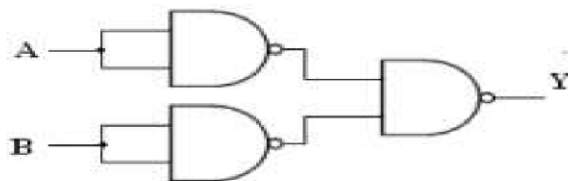
(a) NOT gate: $Y = A'$

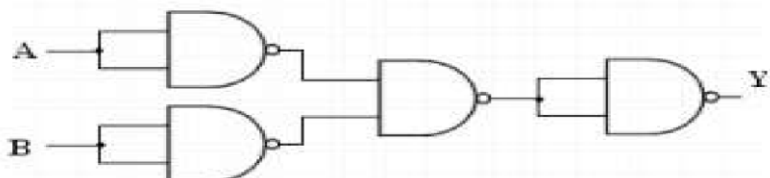| A	Y
0	1
1	0

(b) AND gate: $Y = A \cdot B$

A	B	Y
0	0	0
0	1	0
1	0	0
1	1	1

(c) OR gate: $Y = A + B$

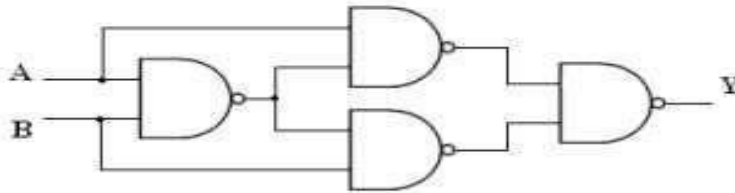| A	B	Y
0	0	0
0	1	1
1	0	1
1	1	1

(d) NOR gate: $Y = (A + B)'$

A	B	Y
0	0	1
0	1	0
1	0	0
1	1	0

(e) Ex-OR gate: $Y = A \oplus B$

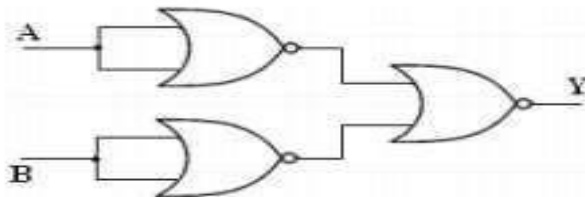| A	B	Y
0	0	0
0	1	1
1	0	1
1	1	0

Implementation using NOR gate:
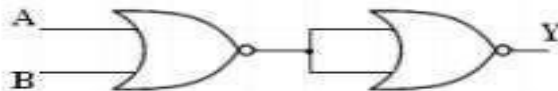
(a) NOT gate: $Y = A'$

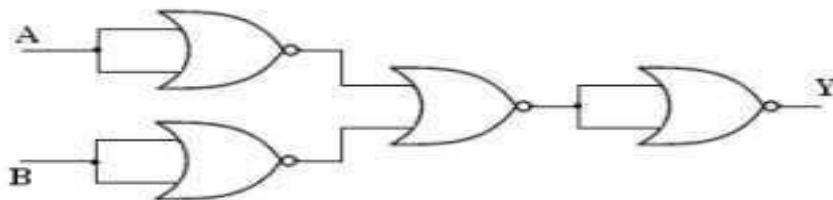| A	Y
0	1
1	0

(b) AND gate: $Y = A \cdot B$

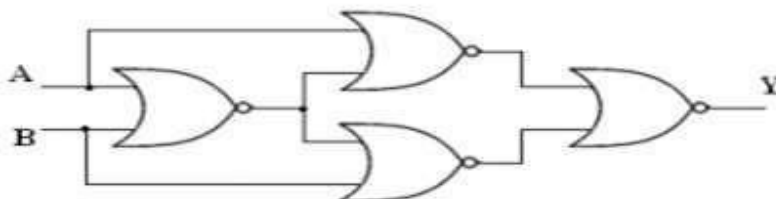| A	B	Y
0	0	0
0	1	0
1	0	0
1	1	1

(c) OR gate: $Y = A + B$

A	B	Y
0	0	0
0	1	1
1	0	1
1	1	1

(d) NAND gate: $Y = (AB)'$

A	B	Y
0	0	1
0	1	1
1	0	1
1	1	0

(e) Ex-NOR gate: $Y = A \odot B = (A \oplus B)'$

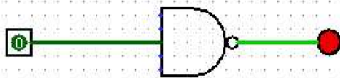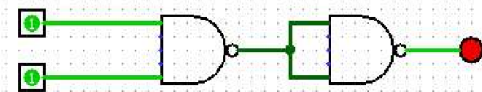| A	B	Y
0	0	1
0	1	0
1	0	0
1	1	1

Procedure:

a) Connections are made as per the circuit diagrams.

b) By applying the inputs, the outputs are observed and the operations are verified with the help of truth table.
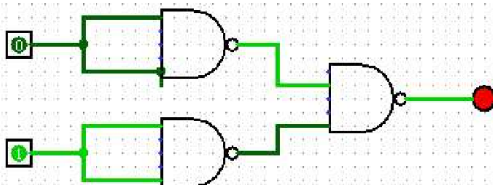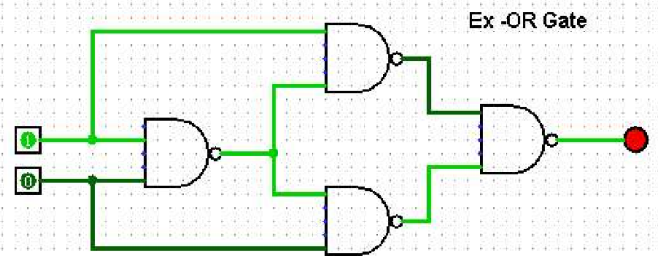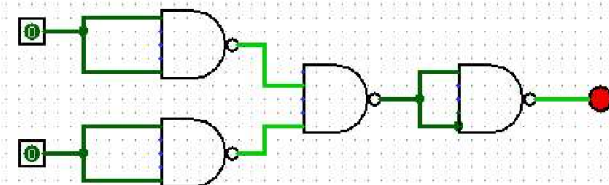

Implement using NAND Gate

Implementation using NOR Gate

NOT Gate

AND Gate
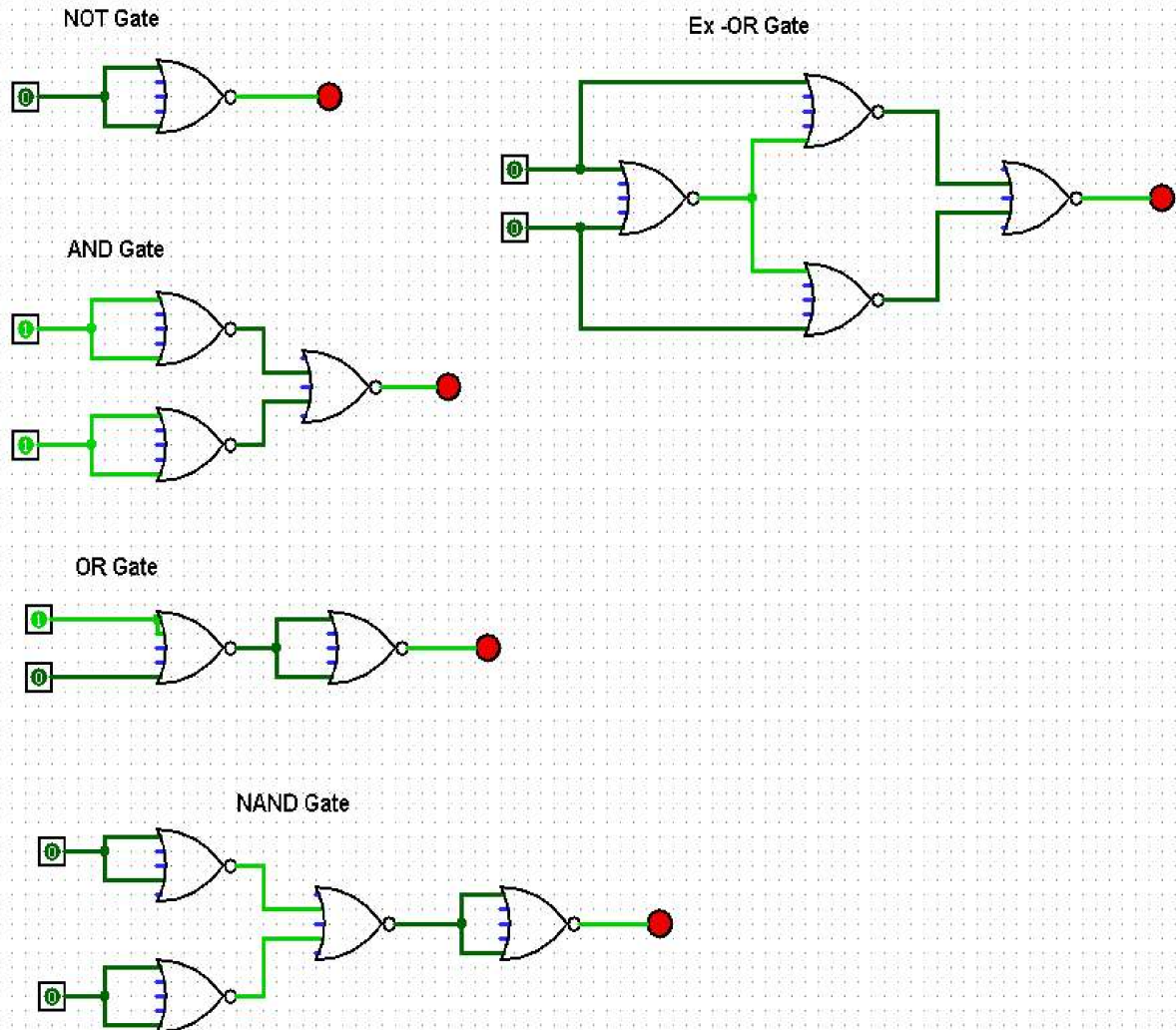
OR Gate

NAND Gate

Ex -OR Gate

Conclusion -

Through the use of NAND and NOR gates, this experiment demonstrated their versatility as universal gates capable of constructing any logical function, highlighting their importance in digital circuit design. Understanding these gates' fundamental and universal roles equips us with the knowledge to build and analyze more complex digital systems.